No. II.

ESCAPEMENT WHEEL.

The SILVER MEDAL *was presented to Mr. J. P.* PAINE, 39, *High Street, Bloomsbury, for his Escapement Wheel for Turret Clocks; and the Thanks of the Society were voted to him for his Micrometer Adjustment for the Bearings of the Pallat Axis. The following communication has been received from Mr. Paine on the subject.*

39 *High Street, Bloomsbury,*
November 22, 1837.

SIR,

I BEG to offer, for the inspection of the Society, an improved escapement wheel for Graham's simple and highly effective dead principle.

I am, Sir, &c. &c.

A. AIKIN, *Esq.*
Secretary, &c. &c.

J. P. PAINE.

Long experience having ascertained the merit of Graham's dead-beat escapement, I will content myself with stating, that it is in general use where a perfect time-keeper is required. The one at the Royal Observatory at Greenwich is on this principle, as well as that at Armagh, in Ireland. With the precise performance of that at Greenwich I am unacquainted; but that at Armagh, made by Mr. Earnshaw, and set going on the 1st of March, 1798, has, up to the present time (a period of

near forty years), performed with an " undeviating exactness," thus affording an incontrovertible proof of its intrinsic merit.

In my practice as a clock-maker for public buildings, I have found, from the exposed situation of the work, that when the pendulum is allowed to range *ad libitum*, after having given the impulse, the pallat will occasionally bottom in the escape-wheel, even though the teeth are long. Many have been the attempts to remedy this imperfection, and perhaps that most frequently resorted to has been the very objectionable method of putting a flat piece of metal on the pendulum, to act on the air as a fan; but even this did not always answer the intent, and the serious evil still remained, for, with a two-seconds' rod, and a ball of two cwt., the accelerated force from striking is of great consequence. Still more alarming is the evil with jewelled pallats, as the fine edge of the inclined plane is sure to be injured if it strikes at all. To remedy this defect, I constructed the wheel in question; yet, though perfectly satisfied with the result in theory, I determined to put it previously to the most rigid test, and, after seven years' experience (not in my own hands, but in those of a scientific stranger), I now venture to appear before the Society.

The advantages which I presume to hope my wheel possesses are several.

1. That it effectually prevents the pallat from bottoming in the wheel, since the pallat is always left in space.

2. An increased impetus to the pendulum, which is obtained by the tooth having no bottom; it is, therefore, not encumbered by the metal necessary to support the point of the tooth, and having, in consequence, a greater space at bottom between each tooth, it follows that the

pallats may be much thicker, and their inclined planes longer, to the amount nearly of one-fourth, giving, thereby, an increased impetus to the pendulum, proportioned to the greater length of time that the tooth exerts its pressure on the pallats.

3. Greater steadiness of action; for, each tooth being very short, and supported by a double wheel, having, likewise, a small square bar at each end, forming one piece with the tooth, and fitted and screwed by two nuts into the double wheel, there hence results the most perfect firmness to the whole, without the least danger of derangement.

4. The power of replacing a broken, or injured tooth, by substituting a new one.

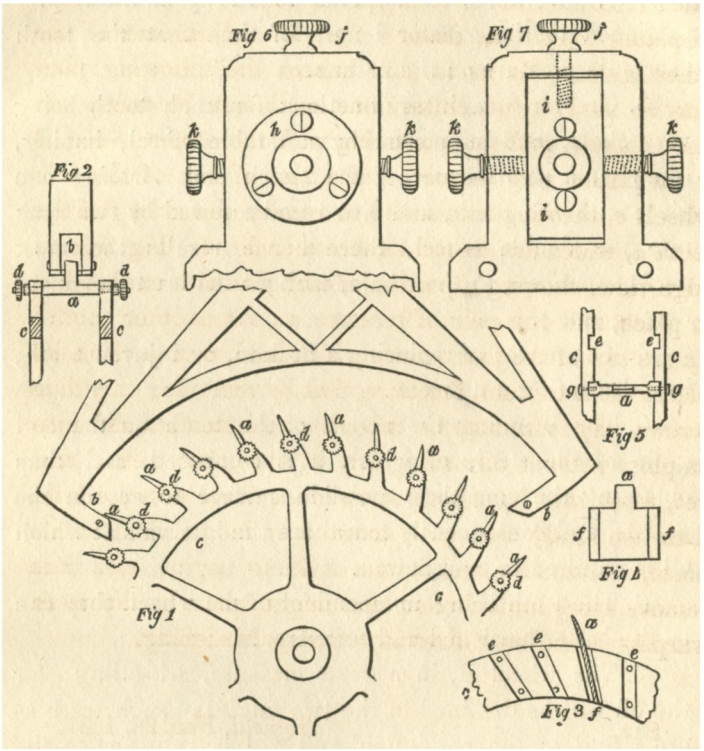
5. The bringing the action of the tooth on the end grain of the steel, of which it is composed, and thus obtaining the smoothest possible surface to act on the pallats, and consequently lengthens the intervals at which oil is required to be renewed.

6. The teeth being independent of the wheel, they can be the better hardened and tempered.

7. The wheel is, in a great measure, self-oiling; for the oil will be detained in the two angles of such teeth as are rising in the revolution, and will be returned to the point when the teeth are descending; in addition to which, there is no rim of the wheel to lead off the oil to the centre.

The wheel, a description of which follows, is a compound one; the teeth are of steel, made, hardened, and tempered separately, and are held in their places between two framed or blank wheels, of gun metal, sufficiently wide apart to allow the pallats to vibrate freely between them.

In fig. 1, *aa* are the teeth; *bb* the pallats, made of polished agate; *cc*, part of one side of the compound



wheel. Fig. 2 shews a part of each side, with one tooth held between. The tooth *a* stands out from a cross bar, which is fitted into square holes in the sides *cc*; each end is screwed, and projects sufficiently to receive the nuts *dd*, by which the tooth and the two sides are firmly bound together. This is the mode in which they have hitherto been made, and it answers well, as affording the means of putting in at first a set of teeth so sound that the chance of needing repair is much lessened. If, however, any

tooth should require to be replaced, the whole of the nuts *d* on one side will have to be taken off, and one side *c* removed; nor is it impossible that such an extensive displacement might disturb the nice adjustment of the other teeth. To avoid this hazard the following plan may be used, by which any one tooth can be taken out and replaced without interfering with the others:—Fig. 3 is an inside view of part of the rim of one of the side wheels *c*, shewing recesses *e e* to receive the sides *f* of the teeth *a*, which are shaped as shewn in fig. 4. Fig. 5 is an edge view, shewing a portion of each rim with one tooth *a* in place, and one pair of recesses *e e* for another tooth: *g g* are two of the four screws which hold each tooth in its place. It is evident, therefore, that by removing only four screws, any tooth may be taken out and another slid into its place without disturbing any of the other teeth; and yet, when they have been screwed in, the recesses *e* hold them so firmly that each tooth may be polished in its place, whilst the wheel is on a dividing engine, and thus remove every imperfection that might occur by the teeth warping in different directions during hardening.

SIR, *Sheffield, Nov.* 28, 1837.

BY the request of my friend Mr. Paine, and from an ardent desire to serve him, so far as a *detail of facts* will do it, I have taken the liberty of addressing this letter to you, on the subject of the newly constructed pallat wheels now before your honourable Society. Hoping that you will consider me most desirous of making the necessary apology for such an intrusion, and as I know that you will be the most able to judge of the combined advantages of that wheel theoretically, you will allow me to offer a few

remarks on *the "practical result,"* having had a wheel of the same construction in action, in a "most excellent" clock made by Mr. P., of which I have had the care since June 1830; during the whole of which period it has gone remarkably well, considering the very exposed and elevated situation of the church,—the clock having three seven-feet dials, sixty feet higher than the summit of the hill, and most nakedly exposed to the north, west, and south winds, on which sides of the tower the dials are placed: but with these difficulties to contend with, I have proved, by two observations—one taken on the 9th of May, and the other on the 10th of August,—that it had only varied during that time seven seconds. With respect to the wheel I would observe, that it has been tested to *the extreme*, and *stood* as *firmly* as though it had been *cast!* The action is steady, equal, and majestic; commanding a vibration rarely to be met with, from the circumstance of the wheels admitting the pallat with an unusually long inclined plane, without the possibility of its ever bottoming the tooth, either by increased vibration or accidentally; and, therefore, I must say that I consider it a real practical improvement, and that I should not think any clock of first-rate quality, with that principle of dead beat, complete without it.

I am, Sir, &c. &c.

GEO. HOLDEN.

The micrometer adjustment for the pallat arbor, or axis, enables the artist to fix the position of the pallats precisely in their place of action on the wheel, and if any wearing occurs, to depress the pallats equal to the loss thus sustained; in short, to restore the escapement to its original state. It is attached by means of two screws, the

holes of which are shewn at the bottom of fig. 7, to the top bar of the frame in which the going train of the clock is contained.

Fig. 6 is an outside, and fig. 7 an inside, view of one of the agate holes for the pallat axis. The agate is fixed in its circular mounting *h*, by the three screws shewn in fig. 6, the hole in which the agate is received allowing room for its adjustment; *i i*, fig. 7, is a vertical slide, carrying the pallat axis and its hole: it is suspended from the adjusting screw *j*, and, after being accurately adjusted, is fixed by the two side-binding screws *k k*.

No. III.

REMONTOIRE ESCAPEMENT.

The SILVER ISIS MEDAL *was presented to Mr. A. P.* WALSH, *No.* 6 *Great George Street, Euston Square, for his Remontoire Escapement; a Model of which has been placed in the Society's Repository.*

THE object of all remontoire, or wind-up escapements, is to insure a perfect equality of vibration in the balance, by preventing it from being affected by any irregularity that may occur, either in the mainspring or in the train. This is done by interposing between the train or escape-wheel and the balance, an impulse-spring, so contrived that it shall be wound up by the train to exactly the same degree at each vibration; and then, being set free, shall give impulse to the balance. The peculiar merit of Mr. Walsh's escapement is its great simplicity; and as, from the com-